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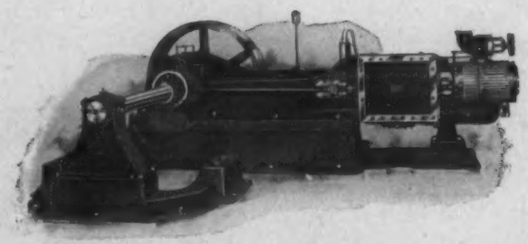

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VOLUME XXIII. SAN FRANCISCO, AUGUST 28, 1909 NUMBER 9

HYDRAULIC CONDUITS.

BY L. R. JORGENSEN.

Almost all early high head water power developments made use of ditch and flume construction to carry the water from the point of diversion to the beginning of the pressure pipe line. It was the easiest and cheapest way, and the low factor of safety was of little account, as it was correspondingly low on the other branches of the system. The main objection to a ditch on a steep hillside is its liability to wash out. If lined with concrete, this liability is lessened, although it still exists. Across flat country, however, a ditch or canal, whether lined or unlined, must be regarded as a safe conduit for power developments. Instead of the ditch along the steep hillside, we have the choice between tunnel and pipe line, or a combination of the two. This combination possibly represents the best solution of the problem of carrying the diverted water to the power house.

Typical Flume Construction.

Of these three different kinds of conduits, the tunnel is probably the safest. If driven through solid rock the sides can be dressed well enough to bring the

value of n in Kutter's formula down to 0.017, with a water velocity of 6 ft. per second, in which case it will hardly pay to line the sides with concrete if the only object is to bring this value down to 0.012. The extra cross sectional area required with $n = 0.017$ would be about one-third more than with $n = 0.012$ for a tunnel with a carrying capacity of 300 second ft. of water.

A concrete pipe line, completely buried, is next to the tunnel the safest kind of conduit; if made of proper material it should last as long as the tunnel and the "hills"; in other words, the depreciation and maintenance is small. The cost of building it is about twice the cost of building a ditch or flume, and half the cost of building a tunnel. The tunnel, however, makes short cuts and therefore may compare favorably with the concrete pipe line in cost. If depreciation and maintenance are taken into consideration, the ditch and flume will not show up much better than the concrete pipe line, and is not to be considered on first-class installations where reliable service is essential.

For maximum economy the system of tunnels and flow pipes should be a closed one, in order to increase the average head. At light load we would have nearly the full static head, and at all loads up to full we would have some pressure in the flow pipe. This pipe line should be so designed and installed as to become a gravity conduit when carrying water sufficient to develop maximum horse power output at the power house.

Another advantage in a closed conduit besides the advantage of increase in head is to be found in the fact that the machinery can draw the water directly from the point of diversion, and, in case the conduit is provided with a small secondary reservoir at the beginning of the pressure pipe proper, this reservoir acting as a standpipe, the closed conduit has no disadvantages. The flow and pressure conduit should be continuous to avoid loss in head by re-acceleration of the water, the secondary reservoir being connected to the main conduit by means of a tee and a short piece of pipe. In this way the secondary reservoir will at the same time act as a differential surge pipe (see paper by Dr. R. Johnson, A. S. M. E., June, 1908).

Fig. 1 shows the hydraulic conduit for a power house. The static head is 1104 feet. The gravity flow pipe is 40,000 ft. long and has to carry a maximum of 200 second ft. of water. It consists of a 6 ft. inside diameter reinforced concrete pipe for the greater part of the length or else of short tunnels. The main consideration for determining the diameter of the pipe was that the average loss of head should not exceed 6 per cent for the whole conduit.

With 200 second ft. flowing in a 6 ft. diameter pipe, the velocity is

$$\frac{200}{28.27} = 7.07 \text{ ft. per sec.}$$

Loss in head:

$$Q = AC\sqrt{s}\,\sqrt{r} = 200.$$

The value of $AC\sqrt{r}$ in Kutter's formula with $n = 0.012$ is for a 6 ft. pipe 4713.9; therefore, $200 = 4713.9\sqrt{s}$; $\sqrt{s} = 0.0424$ which corresponds to a slope of 9.5 ft. per mile. (From table in Kent.)

Then the total loss in head in 40,000 ft., or 7.6 miles, is equal $7.6 \times 9.5 = 72.2$ ft., or $\frac{72.2 \times 100}{1104} = 6.54$ %.

The average loss of head should only amount to about 5%, for this part of the conduit, or 7.28 ft. per mile, which corresponds to a discharge of approximately 175 sec. ft.

The secondary reservoir built at the entrance to the pressure pipe proper is big enough to take care of one day's fluctuation, which may vary from 100 second ft. to 250 second ft. The supply is nearly constant, varying slightly with changes in water levels in primary and secondary reservoir.

The conduit is given a slope of 8 ft. to the mile.

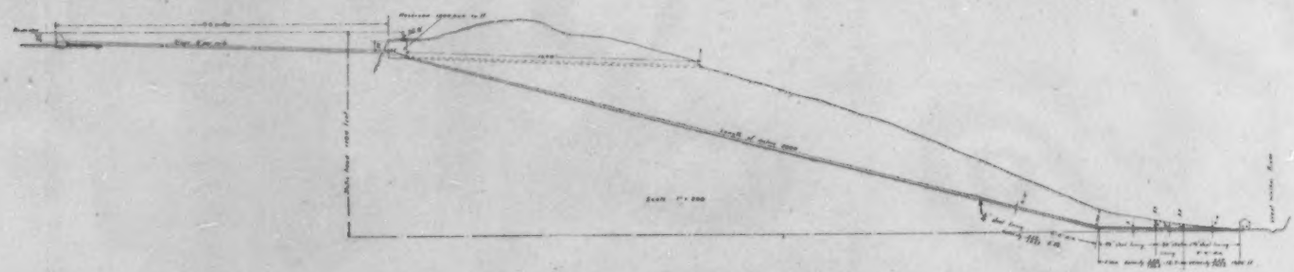

Fig. 1. Section of Hydraulic Conduit.

With 200 second ft. flowing, which we may have in emergency cases, a head at the entrance of $1.5 \times 7.6 = 11.4$ ft. would be necessary to force the 200 second ft. through. With 175 second ft. flowing, no head at the entrance is required, the slope per mile for this volume being 7.28 ft. per mile. The conduit takes the water from a small main reservoir, the dam being 30 ft. in height and the center line of the conduit 25 ft. below the top of the dam. This reservoir being kept practically full of water all the time, the head above the center line of the conduit will be at least 11.4 ft.

The maximum head at the entrance is 25 ft.; with a slope of 8 ft. per mile the maximum possible head at the end of the 7.6 miles of flow conduit would be $25 + 8 \times 7.6 = 85.8$ ft.

With water flowing at the rate of 175 second ft., the pressure in the conduit at the entrance is that due to a head of 25 ft., or 10.82 lbs. per square inch. At the end of the conduit we have a pressure due to the static head minus the friction head $= 85.8 - 7.28 \times 7.6 = 30.5$ ft. It would hardly be safe to use this pressure head for the pipe calculation, as it is variable, but some pressure head between this and the full static head say 50 ft. is chosen. The corresponding pressure per square inch = 21.65 lbs. To guard against the possibility of the head ever becoming greater than 50 ft.

the secondary reservoir is provided with an overflow at an elevation 50 ft. above center line of flow conduit at this reservoir. This brings the surface level of the secondary reservoir 85.8—50=35.8 ft. below the surface level of the main reservoir. With but little water flowing, the friction head may be less than this 35.8 ft., in which case the head would have to be wasted by throttling the entrance gates or otherwise. In the case in question, however, this condition would never take place, as the water is to be used for irrigation after it leaves the power house, and a certain amount must be kept flowing regardless of what is demanded for power. The details of the flow conduit are shown in Figs. 2 and 3, and the details of the inside form in Fig. 4. The outside form is similar to that described by Mr. F. Teichman in the Engineering News of February 20th, 1908. The alligator scheme could not be used for the inside form in this case on account of too sharp horizontal curves.

Fig. 3 shows a graphical analysis of stresses. A certain earth load is assumed and the pipe thickness so determined that the line of pressure stays within the middle half (the cohesive method). The pipe is reinforced with steel; therefore, this method is perfectly safe. The horizontal pressures due to the vertical loads on each voussoir are taken ⅓ Wdl. Fig 3 should be self-explantory.

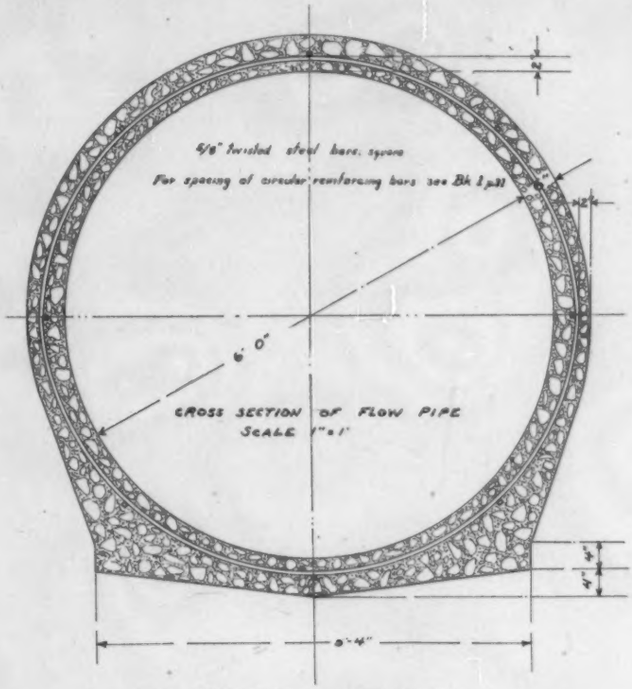

Fig. 2. Detail of Concrete Flow Conduit.

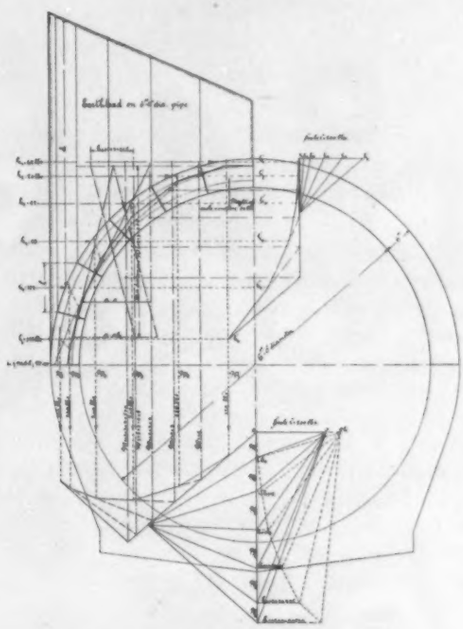

Fig. 3 Graphical Analysis of Stresses.

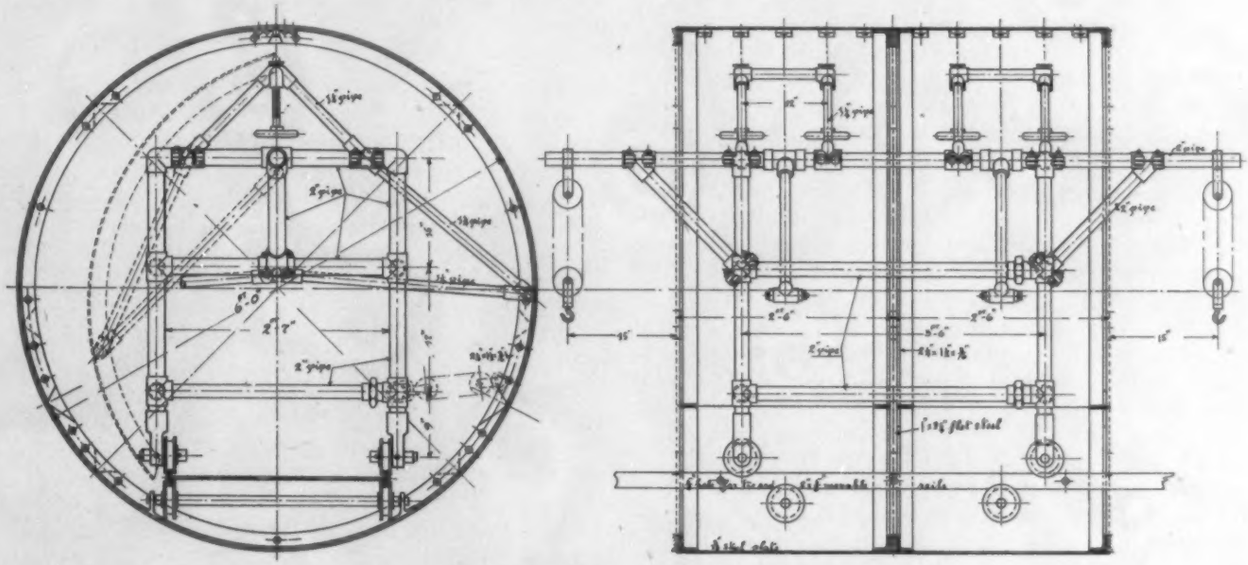

Fig. 4. Form for Making Concrete Flow Conduit.

For longitudinal reinforcement eight ⅝-in. square twisted steel rods are used. The outside shape of the pipe is such that it offers the greatest resistance against the earth pressure with minimum amount of material. For the circular reinforcement ⅝-in. square twisted

steel is also used and the spacing for 25-ft. head is found from

Unit stress per square inch =

$$\frac{\text{Dia. in inches x pressure per square in. x } H}{2 \text{ x area of } \frac{5}{8} \text{ in. sq. bar}}$$

If unit stress per square inch is taken at 12,000 lbs., then $H = \frac{12{,}000 \times 0.78}{780} = 12$ in.

Tension in concrete without reinforcement $\frac{72 \times 10.82}{2 \times 6} = 65$; factor of safety without reinforcement probably between two and three. Possibly the unit stress in the steel could have been raised to 16,000 lbs. per square inch in this case, but to better insure watertightness the lower value is used, the spacing distance being already large.

For 50-ft. head the spacing distance will be half its value at 25-ft. head, or 6 in.

Cost per ft. of concrete pipe (not including excavating and back-filling) with concrete at $12 per yd., in place, and steel at 6 cents per lb. in place.

For 25-ft. head 12 cubic ft. of concrete + 37.7 lbs. of steel = $7.60.

For 50-ft. head 12 cubic ft. of concrete + 64.8 lbs. of steel = $9.21.

From a table of pipe costs at different heads, the actual location of the same is best determined; that is, from the table is found whether it pays to cross a canyon, turning the gravity flow pipe into an inverted siphon, or stay on grade along the hillside.

From the secondary reservoir the pressure conduit proper leads to the power house. Two schemes were considered separately to find out the most economical way of constructing this conduit. On way was to excavate a tunnel 1600 ft. in length through the mountain and use two steel pipes down the hill; another way was to excavate an inclined tunnel 3900 ft. in length to the power house level and a nearly horizontal tunnel for the rest of the distance. The horizontal portion and the lower portion of the tunnel to be lined with steel. Where the steel lining has to be stopped will be determined later by examining quality of rock.

With steel at $200 per ton in place, the tunneling at $20 a ft. and the concrete backfilling (between steel lining and tunnel walls) at $12 per yard, the cost of inclined tunnel was found to be only half the cost of the other scheme. This saving is due to the fact that in the inclined tunnel the rock itself takes up the tension due to the water pressure, the thin steel lining being only there to better insure watertightness where rock is not absolutely solid (see Fig. 5). As the layer of rock above tunnel decreases from say 200 ft. to nothing the plated thickness is increased from ¼ in. to full thickness necessary to alone withstand the pressure. At the same time the diameter is decreased to keep within practical plate dimensions, the least diameter being 4 ft. 4 in. With a unit tensile stress of 12,000 lbs. per square inch, 80 per cent joint efficiency and 1104—35.8 = 1068.2 ft. static head a plate thickness of 1¼ in. is required; thus $t \times 12{,}000 \times \frac{80}{100} = \frac{463 \times 52}{2}$; $t = 1\frac{1}{4}$ in.

The inclined pressure tunnel is thought to be so much safer than pressure pipes laid down the hillside that one can be depended upon with sufficient safety to furnish all the water.

The maximum capacity of the pressure tunnel from secondary reservoir to power house is 250 second ft., and the estimated loss in head 14 ft. with 250 second ft. flowing, or $\frac{14 \times 100}{1068.2} = 1.31\%$. Estimated average loss 7.5 ft. $= \frac{7.5 \times 100}{1068.2} = 0.7\%$ with 175 second ft. flowing.

In order to find the effective head for which the water wheels should be designed, we must first find

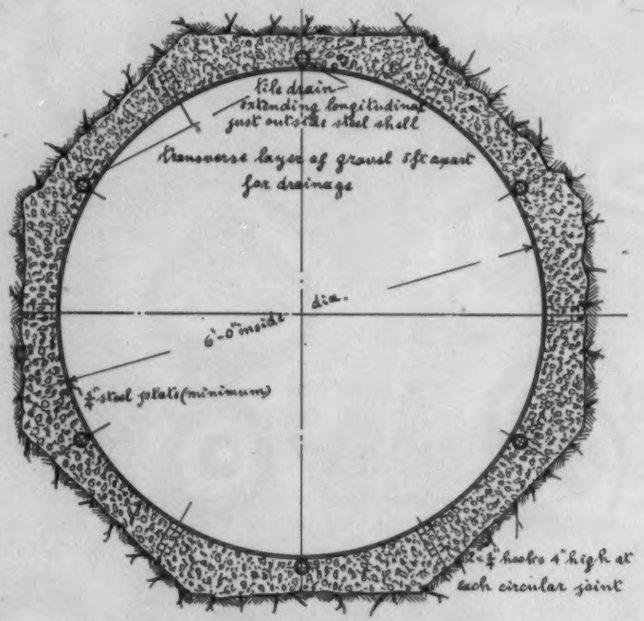

Fig. 5. Detail of Pressure Tunnel Lining.

the average elevation of water level in secondary reservoir. With 175 second ft. in the flow conduit, we have a drop of 55.3 ft., and if we make the assumption that the average water level in the main reservoir is 10 ft. below the top, we have the average water level in the secondary reservoir 65.3 ft. below the top of the main dam. 65.3 + 7.5 = 72.8 ft. represents the total head lost; the mean effective head is therefore 1104—72.8= 1031.2 ft. Any small errors in the calculations and different assumptions can be corrected afterwards by changing the size of secondary reservoir.

This reservoir cuts down the fluctuations in head due to friction loss in the flow conduit from 72.2 ft. to 55.3 ft., and also cuts down the size. The velocity is high and nearly constant, the pipe thereby worked at maximum efficiency at all times. The secondary reservoir also cuts down the maximum static head on the pressure pipe—in this case 35.8 ft. without cutting down the effective head; in fact it increases this head.

The total loss of head with 175 second ft. flowing is 55.3 + 7.5 = 62.8 ft., equivalent to 885 h. p. at the switchboard. For economy the value of the energy annually lost in frictional resistance is approximately

equal to four-tenths of the annual cost of the pipe line.[1] This annual cost being taken as 7.5% of estimated cost.

Thus with power at $20 per h. p. year, 885 x 20 should be equal to 0.4 x 7.5/100 (cost of flow conduit + cost of pressure conduit).

That is 17,700 should equal approximately 0.4 x 7.5/100 (496,000 + 120,000).

17,700 = 18,480, which checks well enough.

Had an open gravity conduit been chosen either flume or ditch in connection with short pieces of tunnel, the same slope—7.28 ft. per mile—could have been used.

In this case the highest possible water level in secondary reservoir would be on the flume grade at this point, or 65.3 ft. below the crest of main dam. The flume grade starting 10 ft. below crest of main dam in order to be able to use this reservoir for regulation to some extent.

How much the average water level in the secondary reservoir would be lower depends upon its size, its shape (whether deep or shallow) and upon the load fluctuations. It might easily be 20 ft. lower, which would represent an average loss of 270 h. p. at the switchboard. Besides this disadvantage, the open conduit does not allow any entrance head to force water through it; whatever entrance head we may have must be wasted in the outlet gates. This conduit must be built for the maximum capacity at the chosen grade.

Comparison of first cost:

40,000 ft. of reinforced concrete pipe for heads from 25 ft. to 50 ft. average—cost per ft. $\frac{7.60 + 9.21}{2} = \$8.40$	$336,000
Excavating and backfilling (pipe completely buried), $4.00 per ft.	160,000
Total	$496,000
40,000 ft. wooden flume with a carrying capacity of 200 second ft., $5.50 per running ft.	$220,000
Excavating and grading, $1 per running ft.	40,000
Total	$260,000
40,000 ft. of wooden stave pipe 6 ft. in diameter—average cost per running ft., $6.50	$260,000
Excavating, $0.50 per running ft.	20,000
Total	$280,000

Maintenance and depreciation:

For reinforced concrete conduit completely buried—	
Maintenance 1% of $496,000	$ 4,960
Depreciation ½% of $336,000	1,680
Interest and taxes—6% of $496,000	29,760
Total	$36,400
For wooden flume:	
Maintenance— 4% of $260,000	$10,400
Depreciation— 4% of 220,000	8,800
Interest and taxes—6% of 260,000	15,600
	$34,800
For wooden stave pipe not buried:	
Maintenance— 4% of $280,000	$11,200
Depreciation— 4% of 260,000	10,400
Interest and taxes—6% of 280,000	16,800
	$38,400

[1]See Paper by Mr. A. L. Adams, A. S. C. E., 1907, Page 177.

Conclusion.

From the foregoing calculations of cost is seen that the reinforced concrete pipe requires a capital outlay nearly twice as great as the other two kinds of conduits, but that the yearly cost is about the same.

To choose correct average values for the depreciation and maintenance of flumes and wooden stave pipes is exceedingly difficult.

On power systems examples can be found of great varieties in length of life of flumes and wooden stave pipes. At one power house two wooden stave pressure pipes 6 ft. inside diameter, 88 ft. maximum head, are used to carry water from the penstock to the turbines. These pipes are laid on top of the ground and half surrounded with stone spalls. They have been in use for nearly ten years and are apparently in good condition and able to give another ten years of service. The wooden flume carrying water from the diverting dam to the penstock is also ten years old and decayed to such an extent that it must be rebuilt entirely within the next four years. The maintenance charges are now heavy.

At another power house two wooden stave pressure pipes (redwood) 5 ft. 6 in. inside diameter and 84 ft. maximum head were installed three years ago, buried in clayish soil. Considerable vegetable matter has been allowed to grow along the line and the pipes have decayed in places to a considerable extent.

Where the country is adapted for ditch construction, this will be the cheapest, as depreciation is practically zero, and maintenance not so great as for flume. It is an open conduit and we would therefore also here have an additional loss of 270 h. p. as against the closed conduit, provided a secondary reservoir is used; otherwise, all conduits would be practically alike as far as hydraulic loss is concerned.

The concrete pipe can be completely buried and is, therefore, protected against snow and rolling boulders. The wooden stave pipe should not be buried, and, therefore, has not this protection. Nowadays the hydraulic conduit is the weakest link in a hydraulic power proposition, as, for financial reasons, it cannot be built in duplicate; therefore, the safest kind for the given case should be used.

A German investigator has found that although the ancient Hebrews were not acquainted with the electric arc light, they used an electric ark protector. The ark of the covenant in the holy of holies of the tabernacle was really a large Leyden jar consisting of a non-conducting material lined inside and out with metal and charged by atmospheric electricity through the gold-covered columns of the temple. The metal in the robes of the priests protected them from the discharge, which was probably powerful enough to kill a person touching the metallic linings.

HYDRO-ELECTRIC MATTERS AT THE SEVENTEENTH NATIONAL IRRIGATION CONGRESS.

To the Editor: The Seventeenth National Irrigation Congress concluded its labors in Spokane, Wash., August 14, 1909, and decided upon Pueblo, Colorado, as its next place of meeting. This convention possessed sufficient importance in regard to hydro-electric development to make a brief synopsis of its work interesting.

The place at which the congress was held can not be said to be a favorable one for securing a calm and dispassionate consideration of any question. The city of Spokane is situated at the very door of the Coeur d'Alene mining district, which is undoubtedly the most radical community anywhere in the United States. This atmosphere of radicalism pervades the city and its press and every thing emanating from Spokane during the congress was more or less colored on this account. It is easy to understand that a large number of people from the neighborhood, particularly from Northern Idaho were in attendance and representation from that locality was greater than from any other part of the United States. In spite of this condition, no resolution was adopted by the Congress that in any way tends to undo the work of the Sixteenth National Irrigation Congress, held at Albuquerque, last year.

The combination of socialism, anarchism and other radical elements failed to leave its impress on the platform adopted by the congress so as to lend any color to a claim that the gathering was opposed to such a policy on the part of the United States Government as would make it impossible for private enterprise to successfully develop the water power of the country, in spite of the statement of one high official that the water power interests were there represented by paid attorneys to secure the passage of resolutions favorable to themselves. The fact is that this is not true. There were few men at the congress either directly or indirectly interested in the development of water power, and it may be said that the congress was conspicuous from the fact that so few who have even the remotest connection with water power development were present. On the other hand, every person who had a grievance against water power companies and every government official in favor of obstructive tactics to prevent the development of water power was there, and these exerted all the influence at their command to so frame the platform as to uphold the radical ideas which if embodied in Government regulations, would effectually prevent any further power development in this country. That no unwise resolution of this kind, directed against those private enterprises which have done so much in developing the water power of this country were adopted, would indicate that the sober sense of the American people is against anything which will retard progress.

It is true that general resolutions endorsing the Forestry Department were adopted. Everyone is in favor of forestry as a permanent institution and believe that it will always be necessary, not only for the water power industries, but for all others.

The only objections which have been made against the Forestry Bureau have been directed against the nature of the permits issued for the development of water power, which have been so framed as to give no assurance that the investment will be protected. Under these conditions the private enterprises have necessarily been compelled to abandon water power development, as it is impossible to enlist capital in an enterprise, the right of which to occupy the public domain is revocable at the will of the Forester, and which can not be transferred from one holder to another, as is often necessary in financing these projects. These obstructive plans of Forestry policy were not endorsed in the resolutions of the congress and the endorsement given relates only to the principles of forestry, if properly administered.

The congress also adopted resolutions against water rights being granted by the states or nation in perpetuity, or without just compensation to the people. Such a resolution is not radical but merely embodies the present law on the subject of water rights. There is in this country no such thing as a "perpetual water right," nor, has there ever been such a thing. Every water right heretofore granted by the states or nation are, and will hereafter be, granted dependent upon the beneficial use of the water, and when this ceases, the water right ceases. Such a construction has invariably been placed upon water power by all of the courts, both Federal and State, and the resolution of the congress in this regard is merely a re-affirmation of existing laws which neither irrigation nor power interests are seeking to alter.

The second part of this resolution relating to compensating the people is an equally well established principle. No water right has ever been granted, either for irrigation or power for which compensation was not given. This compensation may or may not have been a monetary one. If not a monetary one, it consisted in the benefit to the people which would result from the development of the irrigation or power system. This benefit may consist of populating a community, otherwise barren and uninhabited, or in the substitution of hydraulic for steam power in a community already settled, by which rates are lowered and the natural supplies of fuel conserved. The only question in regard to compensation for water rights taken for power is that of adequacy. If the consideration of benefits accruing to the people are sufficient without the payment of money to the State or Federal Government, this is all the charge that should be exacted: but if not sufficient, the right to exact an additional monetary charge which at all times must be just and reasonable exists. This is the way in which the congress viewed the question when adopting these resolutions.

It may be of importance to know that California was represented on the Committee of Resolutions by the Hon. Frank H. Short of Fresno. Mr. Short was one of the strong members of the committee, but did not submit any resolutions for consideration. He was honored by his colleagues by being selected to present the report to the congress. The entire personnel of the committee was of a high and distinguished order —which is abundantly proven by a consideration of the high character of the resolutions they adopted. The

committee's report was adopted by the congress, practically without debate, and by unanimous vote.

The only time that the question of power development was discussed on the floor of the congress was after the address made by ex-Governor Geo. C. Pardee, of California. Mr. Pardee had criticized Secretary Ballinger for restoring to entry lands on which it is alleged that power sites still exist, and in his argument, went to the extent of upholding the withdrawal of power sites indefinitely, and without subsequent restoration for development by private enterprise. After Mr. Pardee concluded, Mr. F. C. Finkle of Los Angeles called attention to the desirability of developing as many water powers as possible to the end that the coal and oil supplies, as well as the forests of the country, may be preserved by substituting for these perishable fuels the imperishable "white fuel" of water power. He asked Mr. Pardee what plan he proposed in lieu of the development of these water powers by private enterprise. To this Mr. Pardee replied that he only advocated the withdrawal of water power for the purpose of offering them to private enterprise for immediate development. It therefore seems that even ex-Governor Pardee, who has always been supposed to be a supporter of the present forestry regulations, recognizes the necessity of such regulations as will make it attractive for capital to develop water power.

It is well known that under the present regulations capital is afraid to invest in the development of water power dependent upon Federal permits. The requirements from the Government which will again stimulate the development of water power are also pretty well understood. It will be necessary to grant a permit for the full length of time so as to enable capital invested to earn not only interest during the time it is used but also all other expenses, such as operation, maintenance and depreciation and to repay itself fully during the life of the permit. A calculation of the time required for this cannot be made too closely, as we know that many unforseen contingencies arise during the life of power plants, such as unforseen catastrophies, practically or wholly destroying the property, and the action of legislative bodies in sometimes fixing the rates for services lower than was anticipated when the plant was originally constructed. In fact it is claimed by those interested in power plants that it is not possible to figure the time required for the life of a permit with anything like exactness, owing to the numerous unforseen contingencies which may arise from time to time. The demand for a perpetual permit has therefore been made by capital and the unreasonableness of this cannot be shown as long as the various legislative bodies in the nation have the right to regulate rates to be charged by power companies, as this offers all the protection needed by the people against power monopolies and trusts.

At the irrigation congress mention was made of a supposed water power trust, by the more radical Government officials and delegates in attendance. However, no one at the congress showed what this supposed trust is, who it is, or where it is. It was merely used as a scare-crow or bogie to frighten delegates who did not understand the real conditions. As a matter of fact, all intelligent people know that there is no such thing as a water power trust in the United States, and further, that no such thing is possible. It is quite certain that a great majority of the delegates at the congress knew this and treated the reference to a water power trust as mere political "clap trap."

When it is remembered that the securities of water power companies now operating in this country are widely distributed among small investors, the claim of any water power trust being a reality or a menace is absurd. The very methods of financing water powers makes the creation of such a trust impossible. The promoters of new water power companies are invariably local people with modest means who have to invest their own money in the early stages so as to later finance these projects. The money they thus invest is returned to them in stock of the company and when they secure some underwriter to handle their bonds to complete the development, they often have to surrender a large amount of the stock of the company to the underwriter. These underwriters are legitimate banking houses in different parts of the country, who merely affix their guarantee to the bonds and stock which they handle and then resell these securities to the common people. They are merely operating for the profit which they derive from selling the bonds and stocks, the same as a merchant does in handling his wares. In the course of their business, these securities of the power companies therefore find their way into the hands of the small investor, after being guaranteed by the underwriter, and it is in this way that the securities of the power companies have been distributed and are being held today.

No importance was attached by the water power interests present at the congress to the controversy between Forester Pinchot and Secretary Ballinger. The water power interests are in no way concerned about this controversy, as Secretary Ballinger has never done anything more for them than has Mr. Pinchot.

The matter appears to be merely a personal attack by Mr. Pinchot on Secretary Ballinger for the reason, as it is claimed, that the latter has declared it his policy to adhere strictly to the laws of the country in the conduct of his department. Mr. Pinchot advocated before the congress the side-tracking of law when in the judgment of an official this is better for the people than to have the laws enforced, and his criticism of Secretary Ballinger appears to be due to the fact that the latter does not take that view of the question. This is a question which does not concern any one industry, whether it be water power or anything else, but it properly concerns everybody in the United States and it is for the people of the United States to say whether law shall be supreme or whether it may be modified by the will of an official.

Centrifugal air compressors driven by electric motor or steam turbine, are now manufactured to give a pressure of from one to four pounds per square inch in the single stage and for 15 to 25 pounds in the multi-stage type.

NATURAL GAS AS REAL PROPERTY.

BY EMERSON W. READ.

The principle that water percolating in the soil and forming a part of the soil is real property is as old as the law of real property. Until water is severed from the soil in which it percolates and is controlled by its owner it retains its identity as a material part of the land in which it reposes. So far is this principle applied that the Supreme Court of California has determined that water diverted from its natural bed or stream and conducted by irrigation ditches for irrigation purposes remains real property as long as it remains in the ditches and is not severed from the soil.

Natural gas and petroleum, in common with water, are closely related to soil. Because of this close relation the law has given to gas and petroleum the dignity and position attributed to real property. Gas and petroleum are consistent elements of the earth's crust and until severed from their depositaries in the soil are subject to American and English rules of real property.

In this country one famous case has arisen in the Pennsylvania gas regions which clearly sets forth the relation of gas to real property. This decision (Westmoreland and Cambria Natural Gas Co. v. Ira de Witt, 130 Pa. 235) arose on an appeal from an order dismissing a bill for an injunction against drilling a well on territory claimed under a lease. Quoting from that decision it will appear: "Gas, it is true, is a mineral, but it is a mineral with peculiar attributes which require the application of precedents arising out of ordinary mineral rights, with much more careful consideration of the principles involved than the mere decisions. Water, also, is a mineral, but the decisions in ordinary cases of mining, etc., have never been held as unqualified precedents in regard to flowing, or even percolating, waters. Water and oil, and still more strongly, gas, may be classed by themselves, if the analogy be not too fanciful, as minerals ferae naturae. In common with animals, and unlike other other minerals, they have the power and the tendency to escape without the volition of the owner. Their "fugitive and wandering existence within the limits of a particular tract is uncertain." They belong to the owner of the land and are part of it, so long as they are on or in it, and are subject to his control; but when they escape and go into other land, or come under another's control, the title of the former owner is gone. If an adjoining, or even a distant, owner, drills his own land and taps your gas, so that it comes into his well and into his control, it is no longer yours, but his."

In an Indiana case (Peoples' Gas Co. v. Turner, 31 Ind. 277) it is said, "It has been settled in this State that natural gas, when brought to the surface of the earth and placed in pipes for transportation, is property, and may be the subject of interstate commerce. Water, petroleum oil, and gas, are usually classed by themselves as minerals possessing in some degree a kindred nature. It is a familiar maxim that in contemplation of law, land always extends downward as well as upward, so that whatever is in a direct line between the surface of any land and the center of the earth belongs to the owner of the surface. Mr. Angell says that it would seem to follow from this maxim that whether what is subterranean be solid rock, minerals or porous soil, or salt springs, or part land and part water, the person who owns the surface may dig therein, and apply all that is there found to his own purposes ad libitum. What is said of the fugitive character of percolating water and of petroleum oil applies with greater force to natural gas."

In this same connection a part of the decision in Hague v. Wheeler (157 Pa. 324) is interesting. There it is said: "But the owner of the surface is an owner downward to the center, until the underlying strata have been severed from the surface by sale. What is found within the boundaries of his tract belongs to him according to its nature. The air and the water he may use. The coal or iron or other solid minerals he may mine and carry away. The soil and gas he may bring to the surface and sell in like manner to be carried away and consumed. His dominion is, upon general principles, as absolute over the fluid as the solid minerals. It is exercised in the same manner and with the same results. He cannot estimate the quantity in place of gas or oil, as he might of the solid minerals. He cannot prevent its movement away from him towards an outlet on some other person's land, which may be more or less rapid, depending on the dip of the rock or the coarseness of the sand composing it; but as long as he can reach it and bring it to the surface, it is his absolutely, to sell, to use, to give away, or to squander, as in the case of his other property."

The ownership that the land owner has in gas that exists naturally in his lands is well shown in Ohio Oil Co. v. Indiana (20 Sup. Ct. Rep. 576). The Statutes of Indiana restricted waste of gas and oil by providing that it was unlawful to permit the flow of gas or oil from a well to escape into the open air without being confined within the well or proper pipes or other safe receptacles, for more than two days after gas or oil shall have been struck in the well. The oil company attacked this statute on constitutional grounds, contending that private property was being taken from owners without adequate compensation and hence, without due process of law. The Court upheld the statute constitutionally contending that the owner of the surface had no property right in the gas or oil until he had actually reduced it to possession, or, if he has any right in the gas or oil until he reduces it into possession, it is a right in common with the co-equal right of other landowners to take from the common source of supply, and therefore subject to the legislative power to prevent a destruction of the common property by one of the common owners. This case is a much cited one and unquestionably represents the rule on the question.

A decision of much interest and of some question is that of Detlor v. Holland (57 Ohio St. 492). A lease conveyed "all the iron ore, fire clay, and other valuable minerals" in a certain described portion of land, together with the right to use so much of the surface of the land as may be necessary "for pits, shafts, platforms, drains, railroads, switches, side-tracts, etc., to facilitate the mining and removal of such coal, ore, and other minerals, and no more." The Court held that this lease did not convey petroleum

oil and natural gas existing in the soil under the surface described, as the words "other minerals," although broad enough to include oil and gas, were not apparently intended to include them. The reasoning of the Court was this: "We conclude that the title to the oil did not pass under said conveyance, but remained in the owner of the soil, and upon his death passed to his heirs. There is nothing to show that it was the intention of the parties that oil should be included in the word "minerals," and the easements granted, in connection with the mining right, are not applicable to producing oil, and show that oil was not intended to be included in the conveyances. If it had been, apt words would have been used to express the intention."

Boiler Efficiencies — Oil Fuel

Showing the maximum theoretical boiler efficiency, for a given per cent excess air supply and flue gas temperature, and the corresponding possible per cent saving in fuel due to operating the boiler at 80% efficiency, based on conditions given below.

CHAS. C. MOORE & CO. ENGINEERS. SAN FRANCISCO-CAL.

Assumed Per Cent Excess Air Supply	Assumed Temperature of Flue Gases																			
	400°		425°		450°		475°		500°		525°		550°		600°		700°		800°	
	Calculated Boiler Efficiency and Per cent Fuel Saving																			
	Eff.	Sav.	Eff.	Sav.	Eff.	Sav.	Eff.	Sav.	Eff.	Sav.	Eff.	Sav.	Eff.	Sav.	Eff.	Sav.	Eff.	Sav.	Eff.	Sav.
0	84.78	-5.98	84.22	-5.28																
10	84.20	-5.25	83.59	-4.49	82.98	-3.72														
25	83.33	-4.13	82.65	-3.32	81.96	-2.45	81.27	-1.59												
50	81.89	-2.36	81.08	-1.35	80.27	-0.34	79.46	+0.67	78.65	+1.69										
75	80.44	-0.55	79.51	+0.61	78.58	+1.78	77.66	+2.93	76.73	+4.09	75.80	+5.25								
100	78.99	+1.26	77.94	+2.58	76.89	+3.89	75.84	+5.20	74.79	+6.52	73.75	+7.82	72.70	+9.13						
125			76.37	+4.54	75.20	+6.00	74.03	+7.47	72.86	+8.93	71.69	+10.40	70.52	+11.85	68.18	+14.78				
150					73.51	+8.12	72.22	+9.73	70.93	+11.31	69.64	+12.95	68.35	+14.59	65.28	+18.40	60.61	+24.20		
175							70.41	+11.99	69.00	+13.78	67.59	+15.54	66.18	+17.30	63.30	+20.89	57.71	+27.90	52.07	+34.99
200									67.07	+16.19	65.54	+18.10	64.01	+20.00	60.94	+23.82	54.28	+32.20	48.69	+39.19
250											61.44	+23.20	59.66	+25.42	56.11	+29.90	49.03	+38.70	41.94	+47.70
300													53.32	+30.88	51.29	+35.92	43.23	+46.00	35.17	+56.00

Approximate Relation between Per cent CO_2 and Excess Air Supply as per Assumptions below.

Per cent CO_2	4	5	6	7	8	9	10	11	12	13	14	15	15.52
" " Excess Air	270.4	197.5	149.0	114.3	88.3	68.0	51.8	38.6	27.6	18.2	10.2	3.3	0

In the above table the following assumptions have been made:- Boiler room temperature, 100° F; humidity of atmosphere, 80%; B.t.u's per lb. of oil, 18600; moisture in oil, 1%; air per lb. of oil, chemically required, 14 lbs.; loss by radiation 3%, complete combustion; per cent excess air stated is measured at boiler outlet and consequently includes air leakage through boiler setting.

Correction should be made for any variation from above assumptions. The most likely variable is the loss by radiation, which, for boilers with brick setting varies from approximately 2% for large to 4% for small boilers.

Illus:- Saving which could be made by operating at 80% eff. instead of 75.2% is (80-75.2) ÷ 80 = 6%, which means that 6% of fuel required when operating at 75.2% boiler efficiency would be saved if boiler efficiency were increased to 80%.

Above table based on oil having the following analysis: Carbon, 85 per cent; hydrogen, 12 per cent; sulphur, 0.8 per cent; nitrogen, 0.2 per cent; oxygen, 1.0 per cent; water, 1.0 per cent.

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FOUNDED 1887 AS THE
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Licensing Engineers

Elsewhere in this issue, H. D. Saville, a prominent member of the National Association of Stationary Engineers, voices the sentiment of a large following in advocating a State license for steam engineers, such license to be based upon the result of examination before a qualified commission. This plan has already been tried with success in a number of States, and is one that will be welcomed by every progressive engineer. By its requirements any one who fails to pass the examination will not be permitted to take charge of a steam plant. The intent is thus to provide a factor of safety, not only for those working near the boilers, but also for the general public whose lives would be endangered by the chance of explosion if the machinery were in incompetent hands.

Notwithstanding the manifest and manifold advantages of this proposal its enactment will meet with energetic opposition. This opposition is threefold, coming as it does from some of the engineers, a few of the employers and a part of the public. In every case the underlying reason is essentially selfish. The engineer is but human, and instinctively dreads the ordeal of an examination. A tremendous power is placed within the reach of a commission of this character and there is always a possibility that unfair or catch questions will be introduced. Many who possess the requisite knowledge cannot pass a creditable written test because of nervousness. The experienced and capable engineer may receive a lower rating than his more theoretical competitor. This fact is being recognized in our schools where the grading of scholarship is often left to the discretion of the teacher. The personnel of the commission is a most important factor, and one that should not be dictated by political motives. With the assurance of competent and unbiased examiners much of this opposition from the engineers would be removed.

The enforcement of legislation along these lines would tend to improve the general standard of education and skill among all engineers, with a corresponding tendency to increase their pay. This raise in wages will be opposed by short-sighted owners who do not realize that a poor man may cost many times his wages in excessive fuel bills and expensive repairs, not to mention the liability for damage from accident.

A few taxpayers, likewise, are fearful that the cost of maintaining a Board of Examiners would increase their taxes. If this matter were regarded in the light of insurance, both life and fire, it would be seen that the slight cost of up-keep of a commission is amply justified. In some states the expense is largely borne by fees charged for examination, although the advisability of this action is questionable. It is regretable that the question is ultimately reduced to one of politics, but as such it is necessary that every engineer influence favorable legislation from the representatives of his own community.

The Alleged Water Power Trust

In view of the unique position of this journal as the champion of conservation by wise utilization and development of hydro-electric power, we publish with pleasure, the following editorial from the Electrical World of August 19, 1909, as evidence that the East is beginning to regard this question as do we of the West, who are most vitally interested:

Mr. Pinchot, for whose efforts at preserving the forests of the country we have only praise, seems to have become somewhat unnecessarily excited over the water-power situation. He has been misled, apparently, by the fact that two or three large companies furnish nearly all the power transmission apparatus, into thinking that the power plants are actually under their control and that a group of powerful financiers are endeavoring to grab the hydraulic resources of the country. We have been familiar with the development of electrical power transmission in this country from its very beginning, and can assure the worried Mr. Pinchot that he is wasting breath in barking up the wrong tree. This history of power development in this country tells the truth about the situation, and in brief it is substantially as follows: From more than a half century back the chief streams of the East have been under development strictly for local use. The rivers of the New England States in particular have been worked up very carefully in the interest of the textile and lumber trades. The developments are mostly in the hands of old and close corporations as far removed from the speculative grasp of high finance as it is possible to imagine. The same conservative interests are now at work in many parts of the South forestalling in so far as may be the southward drift of textile manufacturing.

When in the early '90s electrical power transmission became practicable, hydraulic properties heretofore unutilizable became useful. Already many had been employed locally for electrical purposes, and the new possibilities of transmission merely extended the list. The early transmission plants for the most part bought and paid for their equipment in the ordinary course of business. As their success was demonstrated, powers more difficult to develop and more distant from a market began to be exploited and their owners often came to the great manufacturing companies for help, since at that time capital in general fought shy of electrical power transmission. Being in business to sell apparatus and having the faith in electrical transmission that is born of intimate knowledge of the facts, the great companies sometimes came to the aid of transmission projects by taking their bonds in part payment for apparatus or lending their influence in helping the placing of securities. This they did to encourage the business on which their own prosperity depended. More often they turned down applicants for such assistance in whose projects they did not feel proper assurance. Those who, from the inside, have tried to get apparently sound propositions through the deadly gantlet of the auditors militant will smile at the idea that the great manufacturing companies have been plotting control of the hydraulic resources of the country. As a joke the accusation is a howling success, but that is all.

After nearly a decade of struggle through hard times, electrical power transmission became a definite and acknowledged success and a legitimate and conservative form of investment. The capital at last was ready to take up the work of development and larger enterprises began to be set on foot. But this confidence on the part of capital came too late to enable it to grasp the hydraulic resources of the country. We think it is not too much to say that in no industry with a similar total investment is there so little community of ownership and action. Something like 900 electric stations already own and operate their own water-powers and these plants are nearly all independent. The few holding and operating companies that own groups of electric stations actually control a very small part of the whole. It is true that here and there groups of independently developed powers have been physically merged into networks. Such merging, however, is technically very desirable since it enables a fuller and more economical utilization of the forces of nature. Two power plants worked together can generally be made to give a larger output than if worked independently and the full employment of the nation's hydraulic resources demands the linkage of many units into such networks. But there is no sign that the networks now formed are part of a deep-laid plot for general control. On the contrary, they are quite independent and are likely to remain so.

The facts on which Mr. Pinchot's error is based are merely those which apply at large to any attempt at government control of natural resources. Capitalists big and little spontaneously rise in revolt at any action in any sphere that threatens their chance for private gain. Public ownership is the nightmare of high finance under all circumstances and it is fought against with desperate energy. Undoubtedly there is opposition to the reservation of water-powers just as there is to forest preservation, or to public ownership of coal mines and railroads, or to such a parcels-post scheme as the country bitterly needs. We have so long lived under the "Prosperity be damned" principle that large and small interests alike resent a change such as Mr. Pinchot is trying to bring about. He is up against a hard fight in which we wish him success. but he fights not a "Water Power Trust," but the "Zeitgeist" of our century and people. Everything he wins from it is a gain for posterity, though his battle is against desperate odds. He complains that the laws are made by and for the benefit of the "interests." He may be right, but the proper remedy is to unmake the laws, not to break them. The President's long judicial experience inevitably leads him to this view which is not likely to be changed. We hope Mr. Pinchot will do all he can legally to conserve the nation's hydraulic resources and so to preserve them as to ensure their wise and full employment hereafter.

He need not fear the opposition of a "Power Trust," which is only a specter of his imagination. Opposition will come vigorously enough from things that really exist. As a matter of fact, the time has now come when water powers are of increasing value and form sound and profitable investments. For their best use they should be developed on a comprehensive plan and not a haphazard, so that the deliberation ensured by government control would be in the long run a good thing for everybody

It is needless for us to repeat what has so often already appeared in these columns, suffice it to state that while we recognize Mr. Pinchot as a conscientious and well meaning worker for the interest of posterity, the fact must not be neglected that there is today no more active and self interested advocate of conservation of both water and forest, than the many companies whose efforts are being hampered by his adverse interpretation of the law.

JOURNAL PORTRAITS

Charles C. Elsasser is one of the best known steam engineers on the Pacific Coast. He came to California in 1868, and after graduating from the grammar school, he learned the machinists' trade. In 1885 he entered the services of the Pacific Mail Steamship Company, and continued in their employ until 1892, at which time he took a position with the California Electric Lighting Company as engineer of station B in San Francisco. Four years later he was transferred to station C, where he remained until 1904. From 1904, until the great fire of April, 1906, he was with the Bay City Engineering and Supply Company. Soon after the fire he was engaged as assistant engineer in the Merchants' Exchange Building, San Francisco.

Charles C. Elsasser

Mr. Elsasser has always been an active worker in the N. A. S. E., and has attended several of the National conventions, being National conductor at the Milwaukee convention in 1899. He was California state president in 1906. At the fair and convention held in San Francisco of June of this year, he was appointed director general of what is conceded to be the best mechanical exhibit given under the auspices of the association. Immediately after the fair, he resigned his position with the Merchants' Exchange and entered the employ of the Lally Company as city salesman for their engineering department.

SAN FRANCISCO NO. 1.

At the last meeting of San Francisco No. 1, P. L. Ennor was installed as president and John T. Stewart as vice president to serve this association for the remainder of the term. The educational committee have arranged for a lecture by Mr. E. B. Parsons on alternating current at our next meeting, August 26th. Mr. Parsons is the expert outside man for the Westinghouse Electric Manufacturing Company.

The educational committee also expects to have the city engineer deliver a lecture in the near future on the Engineering end of the Hetch Hetchy water supply for San Francisco.

PERSONALS.

Seton Porter of Sanderson and Porter, electrical engineers, is in San Francisco.

W. S. Dimmock has been elected general manager of the Pacific Traction Company, Tacoma, Wash.

R. J. Davis, president of the Standard Electric Works of San Francisco, left for the East this week.

A. M. Cantrill has been made manager of the Spokane Falls Gas Light Company of Spokane, Wash.

G. I. Kinney, manager of the Pacific Coast office for the Fort Wayne Electric Works, is in Los Angeles.

Wm. G. Kerckhoff, president of the Pacific Light & Power Company of Los Angeles was in San Francisco last week.

D. W. Ross, chief engineer of the Sacramento Valley Irrigation Company at Willows, was in San Francisco last week.

E. R. Davis, electrical engineer of the Pacific Light and Power Company, Los Angeles, was in San Francisco last week.

Augustus Taylor of the Risdon Iron Works of San Francisco has returned from a two weeks' vacation in Shasta county.

John A. Britton, vice-president and general manager of the Pacific Gas and Electric Corporation, left San Francisco this week for China.

A. J. Turner, chief engineer with Henshaw, Bulkley & Co. of San Francisco, has returned from a four week's trip to Los Angeles and vicinity.

A. S. Kalenborn, representing F. G. Baum & Company in Reno, Nevada, has just returned from a two weeks' vacation in the Santa Cruz Mountains.

F. T. Kitt, Sacramento representative of the Columbus Buggy Company, was in San Francisco this week on business connected with the electric vehicle.

Milan R. Bump of Spokane has been placed in charge of the big $2,000,000 electric generating plant being erected near Joplin, Mo., by Henry L. Doherty & Company of New York.

Albert E. McRae, railway engineer, Boston, Mass., was in San Francisco this week, representing Boston capital that contemplates extensive power development in the West this winter.

F. C. Armstead, supervising engineer of the stoker department of the Westinghouse Machine Company, who for a number of years has been located at East Pittsburg, Pa., has moved his headquarters to the Westinghouse Works, Attica, N. Y., where the stokers are manufactured.

Ralph W. Pope, secretary of the American Institute of Electrical Engineers, New York City, will make a tour of inspection of the Pacific Coast Sections during September, being in Seattle in time to attend the joint convention of the Northwest Electric Light and Power Association and the Seattle Section A. I. E. E., and in San Francisco about September 20th, when he will be welcomed at a dinner attended by all electrical men in the vicinity.

OBITUARY.

Captain Herman P. Schuyler, assistant treasurer of the General Electric Company, and one of the best known credit men in this country, died at 4:30 o'clock August 14th, at his home in Albany, aged 67 years.

It is with deep regret that we announce the untimely death of the wife of H. M. Bliven, electrical engineer with the San Francisco office of the General Electric Company. Mr. Bliven has the sympathy of the entire community in his bereavement. He has been granted a leave of absence and will visit Schenectady and New York.

NEWS OF THE STATIONARY ENGINEERS.

PREAMBLE.—This Association shall at no time be used for the furtherance of strikes, or for the purpose of interfering in any way between its members and their employers in regard to wages; recognizing the identity of interests between employer and employe, and not countenancing any project or enterprise that will interfere with perfect harmony between them.

Neither shall it be used for political or religious purposes. Its meetings shall be devoted to the business of the Association, and at all times preference shall be given to the education of engineers, and to securing the enactment of engineers' license laws in order to prevent the destruction of life and property in the generation and transmission of steam as a motive power.

California.

No. 1. San Francisco. Thursday, Central Hall, 124 Fulton St. Pres., A. C. Arbuckle. Sec., Herman Noethig, 900 York St.
No. 2. Los Angeles. Friday, Eagles' Hall, 116½ E. Third St. Pres., Gabriel Allen. Fin. Sec., Harry Notthoff, 1307 Winfield St. Cor. Sec., W. T. W. Curl, 4103 Dalton Ave.
No. 3. San Francisco. Wednesday, Merchants' Exchange Bldg. Sec., David Thomas, 914 O'Farrell St.
No. 5. Santa Barbara. Geo. W. Stevens, 2417 Fletcher Ave., R. R. No. 2.
No. 6. San Jose. Wednesday. Pres., W. S. Pierson. Sec., Leal Davis, 350 N. 9th St.
No. 7. Fresno. Pres., J. F. Wagoner. Sec., F. J. Whitney, Box 8.
No. 8. Stockton. Thursday, Masonic Hall. Sec., S. Bunch, 626 E. Channel St. Pres., Jos. Gieger.

Oregon.

No. 1. Portland. Wednesday, J. D. Asher, Portland Hotel. Pres., O. H. Reed.
No. 2. Salem. A. L. Brown, Box 166.

Washington.

No. 2. Tacoma. Friday, 913½ Tacoma Ave. Pres., Geo. E. Bowman. Sec., Thos. L. Keeley, 3727 Ferdinand St., N., Whitworth Sta.
No. 3. Walla Walla. 1st and 3d Wednesday, German Hall. Pres., W. M. Quinn. Sec., O. L. Compton, Box 11.
No. 4. Spokane. Tuesday. Pres., Grant Tuttle. Sec., J. Thos. Greeley, 0601½ Cincinnati St.
No. 6. Seattle. Saturday, 1420 2d Ave. Pres., J. H. Beckman. Sec., J. C. Miller, 1600 Yesler Way.

Practical letters from engineers and news items of general interest are always welcome. Write your items regardless of style. Communications should be addressed to the Steam Engineering Editor.

SAN FRANCISCO, Cal., August 13th, 1909.

To the Editor:

I have been interested in the reports of the proceedings of the various State associations of the N. A. S. E. and especially pleased with the determined stand that is being made by the various State officers in the matter of securing and afterwards protecting necessary and proper license legislation. This is a matter of the utmost importance to the N. A. S. E. as it is the cornerstone of the superstructure of education which the N. A. S. E. is erecting by and with the assistance of all of its subordinate associations. While the securing of the passage of State license laws is of the utmost importance and furnishes the strongest incentive to the study of our profession, yet it behooves us to carefully guard such laws after they are entered upon the statute books, to protect them from the manipulations of succeeding legislatures whose chief object in attempting to change such statutes is to serve those whose interests lie in the direction of keeping the members of our craft in the subservient state educationally and otherwise which earlier times witnessed. During my two years' term as president of the California State Association, I made a careful study not only of its present but its future possibilities for usefulness, and as a result of that study have evolved some ideas which seem to be in line with the ideas of my brother officers of the Eastern associations.

First—If we are to have State associations they should be so constituted as to render to the subordinate associations in the various jurisdictions the greatest possible service. The State associations should be given such authority by the National Association as will enable it to direct the activities of the subordinate associations, in all matters concerning the general welfare. In short, it should be a living active force for the upbuilding of the science of steam engineering as well as the more material matters of association government, and not a convenient medium for a pleasant annual outing as has been the case in various instances. The annual State conventions should be made of paramount interest in their respective States and the brightest minds in our profession should be induced to give to those gatherings the very latest and best of their knowledge.

Secondly—I most heartily agree with the National vice-president and officers of the various State associations, notably those of Massachusetts and Connecticut, that the State associations should be accorded representation in the National convention, and as outlined in my last annual report, would go still further if possible. Viz.: I believe it would be proper to insist upon the organization of State associations in every jurisdiction with the proviso that jurisdictions unable to support one be attached to one that is. When this has been fully accomplished the method of selecting representatives to the National convention should be changed. Viz.: From each State association, elect say two delegates, preferably to be chosen from among those who have had the training and experience which naturally comes to those who have acted as State presidents. This would result in a National convention consisting of approximately one hundred delegates, each of whom by virtue of his experience should be in close touch with conditions and the requirements of all the associations in his jurisdiction, and should consequently be able to legislate intelligently.

Thirdly—The above outlined plan would render available much of the money now spent in paying mileage and it would therefore be possible to pay the actual traveling and hotel expenses of the entire National delegation which would remove the objection that many able men now have to attending the National convention, to wit: the great private expense, which they of necessity must assume.

By the present plan our National conventions consist of between seven and eight hundred delegates, the great majority of whom through lack of previous experience are unable to render to their respective organizations any service whatever except the drawing of their mileage (a very doubtful service).

By the proposed plan every National delegate would find ample opportunity to take his full share in the proceedings and thus give to each State the real representation it deserves. The statement that the broadening influence of the present National conventions on those who attend would be lost, would not be borne out by the facts, for in this far western section of the country there was recently held in conjunction with the State convention, a mechanical exhibit which has done more to advance the interests of the N. A. S. E. than all events heretofore transpiring combined, and if this were done in the majority of the States the net result would far exceed that of the single National convention and exhibit. Conceding that the above outlined plan is premature, as stated in the commencement of this letter, some of our best posted members believe it is for the best and will ultimately prevail, and I therefore sincerely trust that the 1909 National convention will adopt the necessary legislation to cause the institution of State associations in the various States. Believing the N. A. S. E. to be the best institution existing for the upbuilding of our craft, and with the desire to see it keep pace with the march of progress and not degenerate into a semi-useless organization, I ask that members will read and discuss this letter in the spirit in which it is submitted.

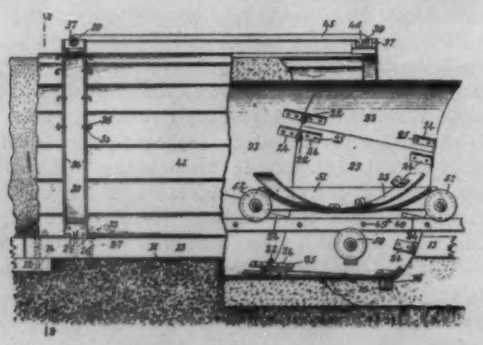
H. D. SAVILLE,
California Association No. 3, San Francisco.

TRADE NOTE

The Crocker-Wheeler Company, manufacturers and electrical engineers of Ampere, N. J., announce that they will open an office in the Ford Building, Detroit, Michigan, on or about September 10th. Mr. Charles W. Cross will be the manager of this branch.

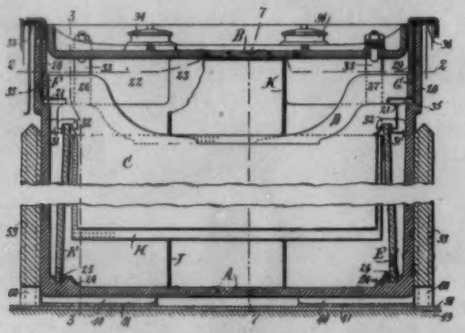
PATENTS

930,813. Apparatus for Constructing Concrete Pipes. Frank Teichman, San Francisco, Cal. In a pipe mold, the combination of a plurality of plates disposed edge to edge so as to form a spiral winding of tubular form, the plates of one turn



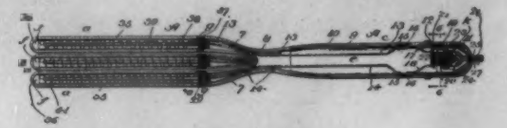
of the spiral being so disposed as to break joint with the plates of the adjacent turn, and fastenings connecting said plates detachably together.

930,728. Storage Battery. Rufus N. Chamberlain and Herbert E. Pratt, Depew, N. Y., and Albert S. Hubbard, Belleville, N. J., assignors to Gould Storage Battery Company, New York,



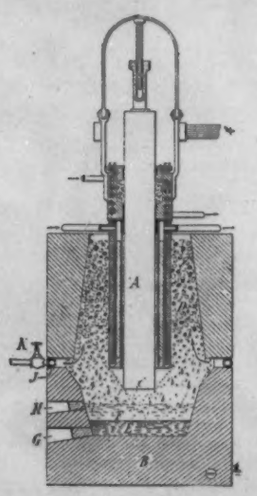
N. Y. The combination of a battery jar having on its inner side at the top a transverse recess extending across the jar, a set of battery plates arranged within the jar, a transverse bus bar connecting said plates and arranged within said recess, and a vertically disposed plate of insulating material within the jar and serving as a support for the battery plates at the ends opposite to those connected to the bus bar.

930,586. Electric Curling-Iron. Charles W. Wilmot, Redondo, Cal. An improved device of the character described, comprising a tubular handle member; electricity supply means located within the handle member; said handle member being provided with a detachable portion; said electricity supply



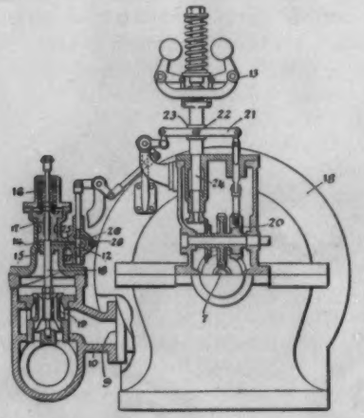
means comprising spring jacks, and a plug member having contact plates adapted for engagement with said spring jacks and provided with supply wires for connection with the supply of electricity; two connected outer heating irons; a relatively movable intermediate heating iron; said heating irons being each provided with electricity resisting means for heating the same and electrically connected with said electricity supply means; and a shield or apron connected with said intermediate heating iron and looped over the outer heating irons.

930,666. Process of Treating Ores. Paul L. T. Heroult, La Praz, France, assignor to Societe Electro-Metallurgique Francaise, Froges, France. The method of treating copper ore containing sulfur which consists in feeding it into an electric arc furnace and passing it gradually through a zone of fusion



adjacent to the arc and drawing through a zone of fusion vals, and simultaneously injecting oxygen in sufficient quantity into the ore above the zone of fusion to oxidize a large part of the sulfur and iron, and to leave only a black copper melt with a slag of gangue and iron.

930,906. Nozzle Control for Elastic-Fluid Turbines. George Westinghouse, Pittsburg, Pa., assignee to the Westinghouse Machine Company. In an elastic fluid turbine, a fluid inlet, a valve controlling said inlet, a



plurality of nozzles communicating therewith, a speed governor adapted to automatically control said valve mechanisms whereby the fluid passing said valve is caused to pulsate and means subjected to constant fluid pressure and sensitive to the variations of fluid pressure admitted by said valve for opening said nozzles.

INDUSTRIAL

APPLICATION OF THE INTERCOMMUNICATING TELEPHONE TO BUSINESS HOUSES.

In connection with the methods of intercommunication for mills and factories which cover a large space or occupy several floors, the automatic intercommunicating telephone has been associated for some time. It has made it possible in these installations to do away with messenger service and by means of it the organization has, so to speak, been brought into closer quarters. Office routine has been markedly simplified by its use, with the result that work is followed or orders rushed out when necessary in much less time and far less confusion.

A new and further advancement in business systematizing has, however, been brought about by the installation of this mode of communication in banks, small stores and salesrooms which occupy one floor and consist of from 5 to 10 departments. This system has grown on its merits, for at the present time inter-communication in a business house is much in demand, and the manufacture of such instruments is a business in itself.

Fig. 1. Office of the President of the Seaboard National Bank Showing Hang Set.

Some of the largest, as well as the smallest business houses in San Francisco have installed intercommunicating telephone apparatus. The following representative concerns are at the present time, using systems of intercommunication, the telephones of which are manufactured by the Western Electric Company, the largest manufacturers of telephone apparatus in the world: Shreve & Co., James D. Phelan, Seaboard National Bank, Westinghouse Electric & Manufacturing Co., U. S. Quarantine Station, New Southern Pacific Hospital, Berkeley National Bank.

The following illustrations show this automatic intercommunicating system as installed in the Seaboard National Bank and the Hill Coffee Company. The types of instruments used in the installations are especially interesting as they show the value of the different sets in connection with the service which is performed through them. Fig. 1 shows the type of instrument used by the President of the Seaboard National Bank. This is a very convenient hand set which can be used at a desk where two desk sets would require considerable space. These sets are extremely convenient, as they consist of receiver and transmitter mounted together in such a way as to be conveniently operated while held in one hand. When not in use, this set is hung from a hook at the right of the desk; it may, however, be hung at any convenient place, being independent of any apparatus in connection with its hanging.

Fig. 2 shows a desk type of this intercommunicating instrument in one of the offices of the Hill Bros. Coffee House. This desk set is very similar to the desk set which is used

Fig. 2. Desk Type in Offices of Hills Bros.

for long distance service and also manufactured by the Western Electric Company, for the Bell Telephone Company. It possesses all the features of operation which the latter set does, and in appearance resembles it very closely. With both these telephones at a desk, the telephone service of the business house is made as flexible and convenient as possible.

Fig. 3. Wall Set in Coffee Roasting Department of Hills Bros. Coffee House.

Only those stations are connected to the outside system which absolutely require such connections. By use of the intercommunicating sets, the office has an interior system which is independent of any operator and ready for use at all times, day or night.

Fig. 3 is a wall type in the coffee roasting department of

the above coffee house. All three types shown in the illustration are used for the same service, each being especially applicable and convenient for the conditions under which they are used.

To secure telephone connection with the different stations to which the instruments are connected, it is only necessary to press the proper buttons. One button is mounted on the face of each of the wall sets (shown in the coffee roasting department, Fig 3) for each of the stations connected to the system, and a name plate is provided with space opposite each button for designating the name or location of the station associated with the button. To make a call therefore, all that is necessary is to press the button opposite the name of the station desired. The act of pressing down the button rings the party, and you talk as with the ordinary telephone instrument. The system is always available for use, since as already seen above, no operator is required. In case a hand or desk set is used, a metal box contains the connection keys and buttons—this arrangement is shown in Fig. 1, and operates the same as the wall type of instrument.

Telephone instruments of the character shown are made of such a capacity as to accommodate either 11, 21 or 31 stations. As seen in the illustrations of the system at the offices and adjoining departments of the Hill Bros. Coffee House, the apparatus is arranged to best suit the conditions under which it is to be used, being furnished in three different styles; one for wall mounting, one for desk use similar to the long distance set, and a special hand set which is very convenient in many cases where room for the desk set is not available.

In connection with the wiring of the equipments, the conductors both for ringing and talking extend through the system in cable, the conductors being provided with double silk and single cotton insulation, colored for identification. In damp interior locations, when not made fireproof by protecting conduits, the cable has a lead cover.

For ringing purposes, when the maximum distance between any two stations is 1300 feet or less, the battery used is sufficient to give a potential of about seven volts with a talking battery of about 4 volts. With 1600 feet as a maximum distance, a 9-volt ringing battery is used and a 4-volt talking battery. It is therefore seen that since no operator is required, the expense connected with this system is largely maintenance consisting of battery supply. This expense, when standard telephone batteries are used is very low.

TRADE NOTES.

The Arrow Electric Company of Hartford, Conn., has purchased the entire capital stock of the Marshall Electric Company and the corporation will hereafter be operated under their name.

The Stromberg Electric Manufacturing Company, makers of the Chronograph, will remove from their present location at 23-25 South Jefferson Street, Chicago, to 114-116 North Jefferson Street, Chicago, on about September 1st.

The Allis-Chalmers Company of Milwaukee, Wisconsin, has entered the field as manufacturers of machinery for sand-lime brick and has employed as commercial engineer Mr. Franklin Henshaw, an engineer of wide experience in this line and formerly associated with the International Sand-Lime Brick Company of New York City.

Benjamin R. Western and W. Hull Western, until August 1st, 1909, respectively proprietor and manager of the Manufacturers' Advertising Bureau, 237 Broadway, New York, and Walter Mueller and W. H. Denney, until August 1st, 1909, respectively president and treasurer of The Banning Company, 225 Fifth avenue, New York, have organized the Manufacturer's Publicity Corporation, with offices at the Hudson Terminal Building, 30 Church Street, New York.

The United Illuminating Company, Bridgeport, Conn., is installing a Westinghouse 500-kilowatt steam turbine for driving a 650-kilowatt ampere, 2400-volt, three-phase, 60-cycle Westinghouse alternator which is to feed into the distribution system serving the city of Bridgeport and surrounding territory with light and power. The present installation is an addition to the existing equipment of a 300-kilowatt Westinghouse turbine driving a Westinghouse alternator, besides several small belted units.

The Westinghouse Storage Battery Company, which was incorporated July 12th, has acquired all of the plant, patents, and equipment of the storage battery department of the Westinghouse Machine Company and of the General Storage Battery Company, and will manufacture, at Boonton, N. J., both the Westinghouse and Bijur types of storage battery for those classes of service in which each has proven superior. The Westinghouse Storage Battery Company enters the field with greatly increased manufacturing facilities and the best engineering talent obtainable, and will maintain thoroughly equipped testing and commercial laboratories, insuring uniformity of both materials and product. The general offices of the company will be located at Boonton, N. J., with sales offices in the principal cities of the country.

NEW CATALOGUES.

J-M Bricklime asbestos fire brick cement for setting up bridge walls and inner courses of boilers is described in a leaflet from H. W. Johns-Manville Company.

The O.-B. Bulletin for August, 1909, from the Ohio Brass Company of Mansfield, Ohio, contains valuable articles on bonding and catenary construction in addition to general items of interest.

H. W. Johns-Manville Company have issued a booklet illustrating applications of their J-M Asbestoside, a fireproof, weather-proof siding, which takes the place of clap boards, shingles or metal.

Bulletin No. 4665, just issued by the General Electric Company, entitled "Electrical Operation of Pulp and Paper Mills," will be of interest to operators of paper mills, inasmuch as it illustrates and describes the application of the electric motor to the paper industry.

A small folder issued by the General Electric Company contains data relative to the new G. E. tungsten lamp, which should be of general interest. It shows in dollars and cents the saving resulting from the use of the tungsten lamp in place of the ordinary carbon lamp.

In Booklet No. 3839, recently issued by the General Electric Company, is illustrated and described a line of eight-inch four-blade fans which the company has designed for use in residences, small offices and telephone booths. It also describes a 12-inch, six-blade fan for office use. This line includes fans for both alternating and direct current.

In Bulletin No. 4680, just issued by the General Electric Company, sign lighting with tungsten lamps is discussed at considerable length and detail. The comparative cost of sign lighting with carbon and tungsten lamps is shown by means of curves, and the superiority of the tungsten over the carbon lamp is clearly proven. This bulletin will be of interest alike to the central station man and the customer.

Bulletin No. 4688, recently issued by the General Electric Company, describes a new meter board made of moulded material which is intended to replace the customary wooden board used in mounting meters. The advantages claimed for this board are: Economy, durability, interchangeability and appearance. The board is provided with a supporting screw at the top, and two adjustable clamps at the bottom, which permit of quick leveling and securing of the meter.

ELECTRIC LIGHTING AT MISHAWAKA.

Mishawaka with its St. Joe river and manufacturing facilities, has long been known as "The City of Power." Today this is changed to read "The Indiana City of Light and Power." For years Mishawaka has been content with arc lamps hanging from ropes suspended high above the street on poles. These scattered along from square to square gave light to the crossings throwing the rest of the thoroughfares into shadows.

Early in the year the Business Men's Association decided that if the city could have plenty of power it ought to have light in keeping. Immediately plans were made for a revolution in the city system. Many suggestions were made for improving the old arrangement but finally a column about 15 feet long with lamps dropping over from the top, was selected.

New Lighting System at Mishawaka, Indiana.

The job was given to the Dodge Manufacturing Company of Mishawaka, power transmission engineers, and in short order the new posts complete were delivered and placed in position. Four to six were installed for each square and one or two thrown in for good measure where needed. Only the business section was used but as this represents a large area a large number were required.

The posts are a combination of cast and wrought iron resting on a 16-inch square base. They were made in three sections, the first two being of 3-inch and 4-inch pipe and joined by cast iron fittings. Two arms drop over from the side posts while four are used for the corners. These are made of 1½-inch pipe with fancy scroll supports. The width between the post and the arms is 20 inches. The side posts have two drop lights with one at the top; the corner posts have five. Tungsten 16.40 k. w. lamps in milk colored globes turn night into day. The posts are white.

A COMPARISON OF TELEGRAPH COMPANIES.

A financial newspaper of Boston has recently compared the size and importance of the Western Union Telegraph Company and the Mackay Companies. It shows that the Western Union posseses 1,321,190 miles of land wires, while the Mackay Companies possess only 300,000 miles. Of cable lines the Western Union possesses 8400 miles, while the Mackay Companies have 30,500 miles. These figures indicate that the Mackay Companies have developed very much more extensively their cable business than their land service. At present the Commercial Cable Company has under way work for laying 1700 miles of additional cable. The Mackay Companies' lines on land have been confined to the larger centers of population, and have mostly been developed for the purpose of distributing its cable service rapidly upon its own wires.

CIVIL SERVICE EXAMINATION.

The United States Civil Service Commission announces an examination on September 22-23, 1909, to fill a vacancy in the position of topographic draftsman, at $4 per diem, in the Surveyor-General's office, Phoenix, Arizona.

The United States Civil Service Commission announces an examination on September 29, 1909, to fill two or more vacancies in the position of electrical assistant in the Signal Service at Large, War Department, at $1,080 per annum.

NEWS NOTES

FINANCIAL.

LODI, CAL.—A premium of $8,696.52 was paid for Lodi's municipal bonds for $126,800 for water, electric lights and sewer pipes.

UNION, ORE.—A special election has been called for the purpose of voting upon the proposition of issuing bonds for a municipal lighting plant.

FALLON, NEV.—Sealed bids will be received September 15th by the Mayor and City Council for the purchase of one or more of 70 $500 water works bonds.

GLENDALE, CAL.—Sealed proposals will be received by the City Clerk up to September 1st for the purchase of electric light works bonds to the amount of $40,000.

CENTRAL POINT, ORE.—S. A. Koon Company of Chicago were the successful bidders for the water bonds. The constrution of the water system will commence immediately.

CONCONULLY, WASH.—The question of issuing bonds to the amount of $5500 to install a waterworks system will be submitted to the voters at an election to be held in October.

PASO ROBLES, CAL.—The stockholders of the Paso Robles Light & Water Company will on September 30th, hold a meeting to consider the proposition of creating a bonded indebtedness of $50,000.

COLUSA, CAL.—An ordinance has been passed calling for a special election on August 31, 1909, to submit to the qualified electors the question of incurring a bonded indebtedness of $50,000 for the purpose of constructing a water works system.

OAKLAND, CAL.—A deed of trust to secure a bond issue for $800,000 has been filed by the First Federal Trust Company of San Francisco, the Central Oakland Light & Power Company giving the deed. The bonds are to bear 5 per cent interest, and run for 30 years. The power company has been working in Oakland for some time on its lines by which electrical power generated in the Sierra is to be distributed here to the bay cities.

INCOPORATIONS.

LOS ANGELES, CAL.—Hawthorne Acres Water Company, capital stock $25,000, subscribed $30, by C. F. Ellis, L. M. Ellis and B. O. Johnson.

LOS ANGELES, CAL.—Santa Ana-Cazadres Land & Water Company, capital $25,000, $5000 subscribed. Directors, Fred Beau de Zart, J. J. Jenkins, Phil Lyon et al, all of Los Angeles and C. H. Bingham of South Pasadena.

MILES CITY, MONT.—Articles of incorporation have been filed for the Buffalo Rapids Power Company, capital stock $300,000; directors, George W. Burt et al. It is the purpose of the company to build a dam in the Yellowstone river for power purposes.

TACOMA, WASH.—Articles of incorporation of the Western Electric Company have been filed by City Electrician F. H. Lauzon, E. L. Hollingstead, H. D. Nowlin, F. McFarland and J. P. Covert, who are named as members of the board of directors; capital stock, $300,000.

LONG BEACH, CAL.—Incorporation papers for the Harbor Electric Light and Power Company of Long Beach have been filed. The incorporators are S. N. Butters, A. C. Green and J. R. Mason. The incorporation is given a capitalization of $250,000. The gentlemen interested with Mr. Butters are Eastern men. They have bought a site a short way south of the Daisy avenue school. Building plans have been partially completed.

SANTA BARBARA, CAL.—Articles of incorporation of the Pacilc Coast Oil Company with a capital of $10,000,000, were filed at the recorder's office here, August 16th. The principal place of business is San Francisco. The five directors are: Charles N. Felton, L. M. Fisk, George Loomis, George M. Hedges and James Lawlor, all of San Francisco.

TRANSMISSION.

WATERLOO, ORE.—Lebanon Paper Mill Company is improving the power plant and two 500 horsepower water wheels and an electric generator.

METHOW, WASH—Work has been started by the Methow Irrigation Power & Traction Company on its power plant on the north fork of the Methow river six miles above Winthrop.

BAKERSFIELD, CAL.—A franchise that calls for the construction of a power line stretching twice across the western side of the county has been granted by the supervisors to the West Side Electric Company.

WALLA WALLA, WASH.—It is said that the John Day Power Company, of which Dr. N. G. Blalock is a member, will develop the immense water power of the John Day river for distribution over three or four counties.

VALLEJO, CAL.—Sealed bids for a central power station will be received at the Bureau of Yards and Docks, Navy Department, Washington,. September 11, 1909, for a central power station at the U. S. Navy Yard, Mare Island, Cal.

SPRINGER, N. M.—The United States Sugar & Land Company of Garden City, Kansas, has contracted with farmers around Portales, Roosevelt County, N. M., to install a power plant at Portales, to furnish electrical power for pumping for irrigation. About 12,000 acres will be irrigated.

LA GRANDE, ORE.—H. A. Dutch, construction engineer for the American Light & Power Company, has started locating camps preparatory to commencing work on the 18-mile pipe line from Beaver creek to this city. Bonds for $142,000 were approved at the June election for this work.

NEWPORT, ORE.—The Pacific Electric Engineering Co. has just completed a 50 k. w. steam gas plant at Newport and is now installing a 300 k. w. hydro electric plant for the Western L. & P. Company at Washoegal, Wash., for light and power purposes. Power will be furnished the Washoegal Paper Mills.

MONROVIA, CAL.—The Consolidated Reservoir & Power Company recently organized in this city will develop water power and an irrigation system from Elsinore Lake, Riverside County, by the construction of a dyke. A power house will also be constructed. The capital of the company is $1,000,000. The officers are H. Edwin Moore, Los Angeles, president; R. B. Sheldon, Riverside, vice-president; W. B. Scarborough, mayor and of Bank of Monrovia, Monrovia, treasurer and secretary. By October 15th work on the dyke is expected to be under way.

TENINO, WASH.—The Tenino Light, Water and Power Company of Tenino, Wash., is preparing for a 2000 k. w. hydro-electric plant on the Skookumchuck river, the dam to be 60 feet high, 200 feet head. The plant will require three-quarters mile of 5 foot pipe and 16 miles central distribution

transmission at 25,000 volts. Power is to be supplied to Tenino, Centralia, Chehalis, Busodia, Olympia, Roy and Yelm through 50 miles of transmission lines. They are now clearing right of way and building road to dam site. Edwin Gamme of Portland is consulting engineer.

PORTLAND, ORE.—The Willamette Valley Company is installing a 1500 kilowatt steam turbine plant and sub-station at Walla Walla, auxiliary to the present water works plant, to furnish power for lighting and street railway purposes. This company recently started a hydraulic plant on the McKenzie river, 30 miles from Eugene, to produce 10,000 horsepower. Work is progressing on the dam which is to be 40 feet high with 20 feet natural fall. Contracts will be let for equipment before January 1, 1910. This company is also building five miles of track on the line of the Twin Light & Traction Company between Centralia and Chehalis, Wash., and seven miles interurban line between Vancouver and Orchard, Wash. They are also adding a 500 k. w. turbine to the present plant at Eugene.

TRANSPORTATION.

PORTLAND, ORE.—Plans are being prepared for the erection of new and permanent carbarns for the Portland Railway, Light & Power Company at a cost of from $30,000 to $40,000.

MONROVIA, CAL.—The Los Angeles Pacific Company has a force engaged in constructing a trolley line from the northern part of the city to connect with the main line of the Brentwood Westgate Division.

EVERETT, WASH.—Peter Henning has been awarded the contract for the construction of a trolley line by a British Columbia syndicate to connect Vancouver, B. C., with Sumas, Wash. The contract price is reported to be $300,000.

SAN DIEGO, CAL.—Plans are being prepared by the San Diego Electric Railway Company for the construction of modern street car barns to cost $100,000, located on a square bounded by L, M and 15th streets. The barns will be of reinforced concrete.

POMONA, CAL.—The Pacific Electric Company's engineers have completed the surveys for an extension of the Huntington Boulevard line to a point beyond Ganesha park and within a short time a force of men will be at work constructing track.

GLOBE, ARIZ.—Los Angeles capital, headed by John Denair, formerly of the Santa Fe system, has made application to the City Council of Globe, for a street car franchise along the principal thoroughfare. A similar franchise has also been asked by G. W. P. Hunt of Globe.

SANTA BARBARA, CAL.—In order to commence the extension work immediately the Santa Barbara Consolidated Railroad Company will ask a temporary permit to extend its track from Castillo and Fourth streets to the entrance of Oak Park. An application will be made also for a permanent franchise.

CHIHUAHUA, MEX.—The Electric Street Car Company owning lines in El Paso, Texas and Juarez, this State, has obtained a concession to extend its lines in the latter city to the Rio Grande, Sierra Madre & Pacific depot, thence to the new race track, which will be built by the International Racing Association.

PASO ROBLES, CAL.—After watching the earnings of the Paso Robles Street Car Company for years, H. Taylor has purchased the controlling interest in the company. Mr. Taylor states that he and Mr. Sherman expect to immediately expend $10,000 in new equipment and in bettering the physical conditions of the property.

PALO ALTO, CAL.—It is announced that the construction of the campus electric line will be completed within a month. Engineer McPeake of the Peninsula Railway Company is here to superintend the work of construction. The line will be built and owned by the University, and the company will be granted the right to operate its cars over the line, but under such a strict agreement that ownership will never become possible.

SALEM, ORE.—A. Welch, president of the Willamette Valley Electric Company, states that October has been set as the time for the electrification of the Willamette Valley at a cost of more than $1,000,000. The project includes the operation of street car lines, urban and interurban, electric lighting plants and power equipment for Eugene, Junction City, Corvallis, Independence, Dallal, Albany and intermediate towns. Electric power for the whole system will come from the rapids of the McKenzie river, capable of producing 25,000 horsepower. All arrangements for the work are completed, and it is expected to have actual operations commenced by October. The time is also at hand when the Portland, Eugene and Eastern Railway Company will complete its line to Portland.

ILLUMINATION.

SANTA BARBARA, CAL.—Needles will vote this week on a special assessment for maintaining street lights.

LOS ANGELES, CAL.—The East Hollywood district will soon ask for bids for street lighting and will let a contract as soon as possible for actual construction.

SEATTLE, WASH.—The Council has passed an ordinance providing for the installation of cluster lights in 11th, 12th, 13th, 14th, 15th, 16th and 18th avenues, north.

CEDARVILLE, CAL.—The election held here to determine whether or not a lighting district should be formed in Cedarville resulted in the matter being carried by a vote of 35 to 5.

ALHAMBRA, CAL.—The City Council awarded the contract to Woodill & Hulse, Los Angeles, for installing 20 fancy lighting posts for Bushnell and Electric avenue at $375, including wiring.

SACRAMENTO, CAL.—The Sacramento Natural Gas Company has applied for a franchise to lay gas mains in Highland Park, Curtis, Oaks and environs. Bids will be opened by the Supervisors September 22d.

SANTA BARBARA, CAL.—City Attorney Butcher proposes the construction of a municipal plant to generate power for lighting the city and for operating the tunnel now being driven through Santa Ynez mountains for a water supply, the cost being estimated at $10,000.

SAN ROSA, CAL.—Natural gas in considerable quantity was uncovered on the George N. Whittaker ranch in Bennett alley, a few miles southeast of Santa Rosa, last week while men were engaged in cleaning out an old spring which had been ususued for many years.

PORTLAND, ORE.—The directors of the Portland Hotel Company have under consideration the remodeling of the hotel and the installation of a new power plant. J. D. Asher, the chief engineer, will start East in a short time and while there will make a study of modern hotel power plants.

MODESTO, CAL.—The La Grange Light & Power Company has finished its power line from La Grange to this city and will put a large force of men at work in Modesto to connect the primaries and conduits along the streets. The company expects to be supplying power to the people of this city within a few weeks. The company's sub-station, which is just outside the city limits, is now finished and will be ready for use as soon as the primaries are connected.

TELEPHONE.

SALINAS, CAL.—The Supervisors have granted the Buena Vista Telephone Company a franchise for a line of poles along the highway.

VICTOR, MONT.—The Rocky Mountain Bell Telephone Company will build an exchange here in connection with telephone development in Western Montana.

CALDWELL, IDAHO—E. A. Clark and C. J. Sinsel have interested the people of Jordan Valley in a telephone line from this place to the valley and a line will be constructed.

WAUCONDA, WASH.—The United States Government is constructing telephone lines from this point to Anglin and from this place to Bodie. The length of the lines will be 32 miles.

GREAT FALLS, MONT.—George Nelson of Butte has been awarded the contract for the erection of the proposed exchange building of the Great Falls Automatic Telephone Company.

ALDERDALE, WASH.—The Columbia Telephone Company has been incorporated and the line is under construction, covering a large portion of eastern Klickitat County along the Columbia River.

MISSOULA, MONT.—The Montana Independent Telephone Company is preparing to build to the Coeur d'Alenes from here. About $200,000 will be expended by the company in the Missoula Valley.

HOQUIAM, WASH.—The City Council has passed an ordinance granting a franchise to the American District Telegraph Company to construct and operate wires and cables on certain streets of Hoquiam.

PORT ORCHARD, WASH.—The Pacific Telephone and Telegraph Company is spending a large amount of money for the improvement of its system in Kitsap County. Twenty-two thousand dollars is for the improvement of exchange service and $15,000 for long distance service.

PORTLAND, ORE.—The Pacific Telephone & Telegraph Company is installing a new common battery plant, cable inside and outside, at Ashland, Ore., to be in operation within two months and is preparing to install the same as Roseburg. Similar plants were completed in Medford and Grants Pass about a month ago. This puts all Southern Oregon in first class shape. They are constructing a concrete building at Albany to be completed about October 1st.

WATERWORKS.

PORTLAND, ORE.—A contract has been let to Joseph Paquot for laying water mains in Everett street at $5401.

BLUE LAKE, CAL.—Thos. J. Hix Jr., has filed a claim to 500 inches of the waters of Indian creek for power purposes.

DAVENPORT, WASH.—The City Council has accepted a bid from C. A. Neyland of Spokane for 1000 feet of 6-inch wooden mains at 8 cents.

IMPERIAL, CAL.—Bids for building a city water system have been called for by the trustees and it is expected construction will begin early in October.

SEATTLE, WASH.—Sealed proposals for the construction of an addition to the water supply system at Fort Casey, Wash., will be received here up to August 31.

TACOMA, WASH.—The Council has passed an ordinance providing for the laying of water mains of 6-inch, 8-inch and 12-inch pipe in local improvement district No. 542.

SAN JOSE CAL.—Sealed proposals will be received by the Board of Supervisors to August 16th for furnishing and laying about 13,200 lineal feet of 2-inch standard black pipe.

SAN LUIS OBISPO, CAL.—Notice is hereby given that the Board of Trustees of San Luis Obispo will receive sealed bids for furnishing water pipe fittings and lead up to September 1, 1909.

BEAVERTON, ORE.—A. K. Holliday of St. Paul, Minn., has offered to put in a water system here, laying mains from the springs northeast of town, and installing 10 hydrants for fire protection.

GOODING, IDAHO.—The Council has passed an ordinance granting a franchise to the Gooding Development Company, Ltd., to construct and maintain a system of waterworks in Woodworth addition to Gooding.

TURLOCK, CAL.—Sealed bids will be received up to August 31 for materials and labor, with appliances and accessories for the construction of a water system in Turlock according to the plans and specifications on file with the City Clerk.

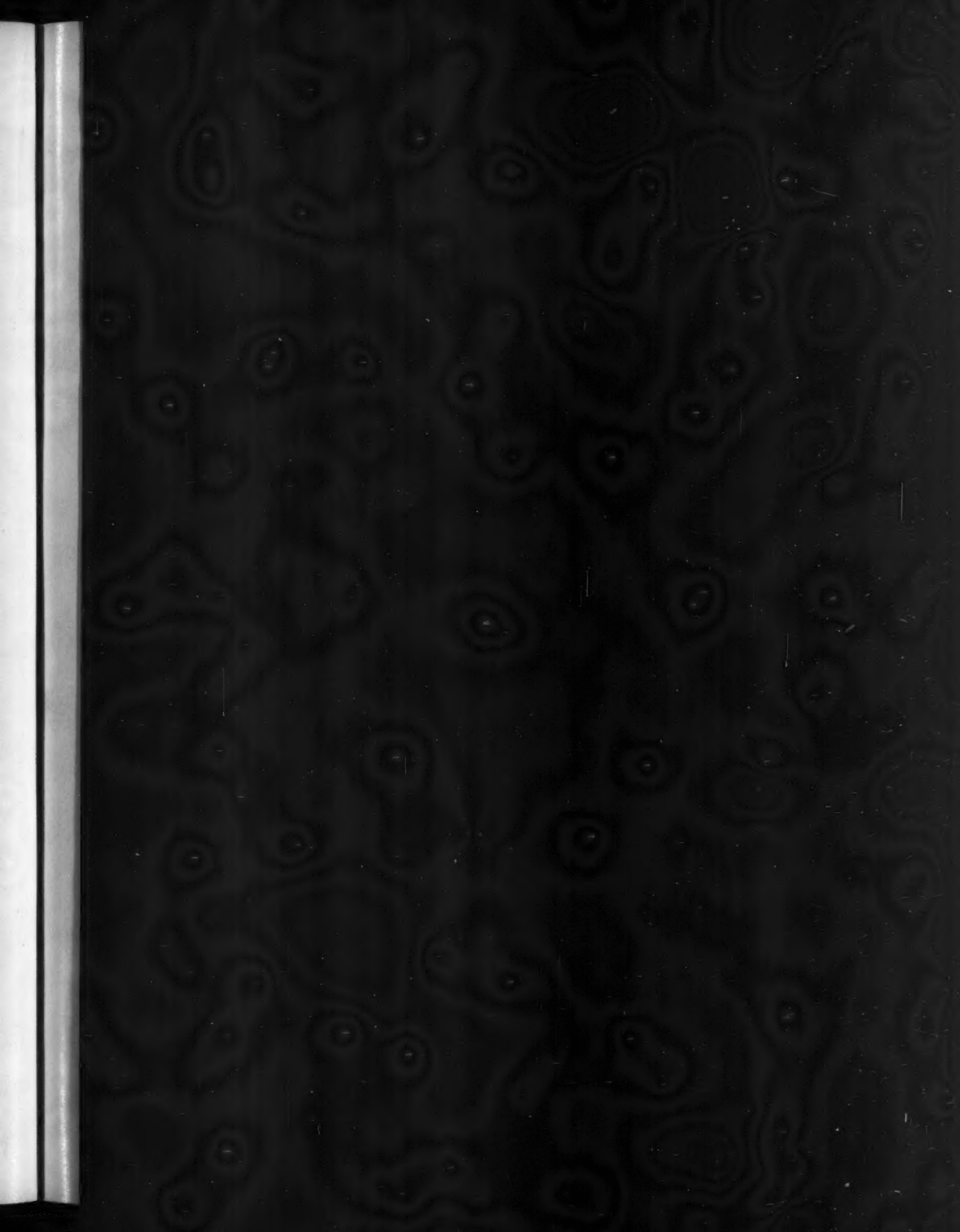
SAN PABLO, CAL.—David Goodale, a mining engineer of Berkeley, who owns considerable property at this place, has filed suit in the Superior Court at Martinez to restrain the People's Water Company from pumping from its wells at San Pablo.

SANTA CRUZ, CAL.—Notice is given that sealed bids for materials and labor necessary for installing a water supply plant and sewer system at the Redwood Park, in Santa Cruz County, Cal., will be received by the State Engineer at his office in the State Capitol, not later than September 4, 1909.

HONOLULU, T. H.—Sealed tenders will be received at the office of the Superintendent of Public Works until August 18 for furnishing f. o. b. steamer's tackle, Kahului harbor, galvanized iron pipe, of the following sizes: 6-inch, 3-inch, 4-inch, 5-inch, 2-inch, 1½-inch, bidders to state price per lineal foot for each size.

YREKA, CAL.—The Siskiyou Electric Power & Light Company is enlarging its Fall Creek power-house to make room for the installation of an additional 1250 k. w. generator. The nine miles of pole line down the Klamath river to McConnell Bar is completed, and the power is now being used at that point by the big dredger built by the Northern California Mining Company.

MODESTO, CAL.—Bids for cast iron six and four-inch water pipe and crosses were received as follows: Crane Co., of Chicago, 16,000 feet 4-inch, $37.20 per ton; 2000 feet of 6-inch $36.20 per ton; 100 crosses, $65 per ton f. o. b. Modesto. United States Pipe Co., 16,000 feet 4-inch, $35.85 per ton; 2000 feet of 6-inch, $34.85 per ton; 100 crosses, $60 per ton, f. o. b., Modesto. The contract was awarded to the United States Pipe Company.

PORTLAND, ORE.—Commissioner T. B. Wilcox has given special instructions to Chief Engineer D. D. Clarke to have the plans and estimates for the proposed water system for Mt. Scott suburb, ready for presentation to the board at the next regular meeting. If these plans are satisfactory to the board the proposed system will be ordered installed immediately. The City Water Board has ordered the laying of a water system for Sellwood at an estimated cost of $25,395.

SAN FRANCISCO, CAL.—Notice is given that the Playground Commission will receive on Thursday, August 26th, 1909, sealed bids to furnish and deliver the following articles, viz: 600 feet of 4-inch water service pipe, galvanized preferred; 700 feet of 2-inch water service pipe, galvanized preferred; 1,000 feet of 1½-inch water service pipe, galvanized preferred; 21 T's, 2x2x1½, galvanized; 2 4-inch plugs, galvanized; 7 2-inch plugs, galvanized; 7 4x4x2x2 connections, galvanized; 21 hydrants, composition; 21 hydrant boxes, castiron.